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Land Rental Markets and Household Farms in Transition:

Theory and Evidence from Hungary

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Abstract

This paper analyses the determinants of household farms' participation in land rental markets in transition countries and what affects their access to land through rental markets. We derive several theoretical hypotheses on the impact of households' management ability, land endowment, land quality and prices, transaction costs in the land market, rural credit and labour market constraints. We test the hypotheses combining a representative dataset on land rental activities of more than 1,400 Hungarian household farms with data from the Hungarian Central Statistical Office. We find that land rental markets reallocate land to households with better farm management capacities and less endowed with land. Households combine buying and renting of land to extend their farms. The continued domination of large farm organizations in some regions restricts household's access to land. Rural credit and labour market imperfections have an important impact on land rental markets.

JEL Classification Q12, Q15, D10, P23

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1 Introduction

Land reform and the creation of optimal land institutions has attracted renewed attention because of its importance in transition processes such as in China, Vietnam, South Africa, the former Soviet Union, and Eastern Europe and because of new political pressure for land reforms in countries with highly unequal land distributions such as Zimbabwe and Brazil. New insights in the functioning of land markets and institutions have also induced renewed attention to land access as a poverty reducing tool (de Janvry et al., 2001).

Much attention has been paid to land sales markets –or, more generally, the transfer of ownership– as an important instrument to enhance efficiency, and reduce poverty. Land ownership transfers come with a number of benefits, such as the potential to use land as collateral. However, in an environment with large uncertainties and high transaction costs, where credit markets and insurance markets are imperfect, land sales markets are typically thin and land sales may be limited to distress sales (Platteau, 2000). In such circumstances, land rental markets can play an important role in improving efficiency – and possibly equity – in land use and access (Sadoulet et al, 2001). As such, the role of land rental markets has recently been re-emphasized as important for providing access to land for the poor and as an efficiency-enhancing institution in environments characterized by large uncertainties, such as countries in transition (Deininger and Binswanger, 2001; Swinnen, 2001).

The objective of this paper is to analyse access to land for small farmers through land rental contracts and sales in transition countries. Transition countries provide a unique opportunity to study the development of land markets as land reforms have reallocated

property rights and liberalized land exchange restrictions. While much has been written on land reforms and farm restructuring in transition countries (eg. Lerman et al. 2002; Swinnen et al. 1997), few studies have provided a formal conceptually and econometric analysis of the development of land markets and their determinants. The few studies have focused on China and Vietnam where transition started earlier (e.g. Brandt et al, 2003; Deininger and Songqing, 2003). This paper is the first to provide a formal analysis of the role of households in land market developments in Central and Eastern Europe or the former Soviet Union.

The focus on households in analysing the development of rental markets in transition countries is important because in many transition countries household farms are using a large part of the agricultural land, although there is large variation. The share of agricultural land used by household farms varies from less than 20% in countries such as Belarus, Slovakia, Russia, and Ukraine to more than 80 % in Albania, Armenia, Romania, and Poland (Lerman, 2001). But even in countries such as Russia where household farms use less than 20% of the land, they produce 60% of total output. Furthermore, the land used by large scale farms is often rented from households.

The focus on households is also important to study the equity effects of the land market developments. An important question is whether the land reforms and liberalized land rental and sales markets will contribute to growing efficiency in agriculture and to improved access to land for small farms and poor rural households in transition countries. There is concern that land market liberalization will lead to a re-concentration of land. While the evidence on this effect is mixed and mostly limited to Latin America, a continent characterized by highly inequality in access to land (see Deininger and Songqing (2003) for a review), Lerman et al (2002) point out that in an environment characterized by asymmetric access to information, capital, and legal means of enforcement, that is typical of transition economies,

reconcentration may be a realistic outcome, with undesirable social and economic consequences.

The paper first develops a theoretical model to analyse the decision-making of farming households to participate in the land market, which incorporates transition characteristics of land ownership, land use, and rural market imperfections. We derive a set of hypotheses on the land market participation of rural households. The theoretical model differs from other models in the literature in two ways. First, the traditional literature on rental markets typically focuses on sharecropping or on the relationship between large landlords and small tenants (Bravermman and Stiglitz, 1982; Bardhan, 1989). While these assumptions are relevant for parts of the developing world, they do not capture essential characteristics of land rental markets in transition countries, which are characterized by dispersed landownership among many rural and urban households and where small farms compete for access to land with large-scale corporate farms (Csaki and Lerman, 1997; Mathijs and Swinnen, 1998). One objective of our study is to analyse how these specific characteristics affect the land rental market and small farmers' access to land.

Second, several recent studies have analysed the impact of factor market imperfections on the development of land rental markets. For example, Carter and Salgado (2001) emphasize the impact of credit constraints, Yao (2000) labour market imperfections, and Skoufias (1995) the effect of land transaction costs. However, transition agriculture is characterized by most, if not all, these imperfections and transaction costs. Therefore, our model incorporates multiple factor market imperfections.

The second part of the paper is empirical and uses a unique and representative dataset on land rental activities of more than 1,400 Hungarian rural households. These data are combined with county-level data collected by the Hungarian Central Statistical Office to estimate the determinants of household rental activities during transition. We selected

Hungary for the empirical analysis for several reasons. First, Hungary has an interesting mixture of household farms, farming companies and cooperative farms: all these farming organizations use a significant share of the land, with household farms using slightly more than 50%. Moreover, there are important regional variations in their relative importance, which allows to test for the impact of land market domination of large farms on household farms' access to land.

Second, Hungary is, certainly in comparison with other transition countries, well advanced in its land reform process. Land titles have been largely distributed. By studying land market developments and household access to land through land rental markets in this advanced transition stage we can analyze whether "everything will be alright when the land reform is finished". In other words, is it sufficient for policy-makers in other countries to focus their attention on implementing the land reform and titling process in order to get the land market going, or are complementary reforms and policies needed?

A related issue which can be addressed in Hungary, in contrast to many other transition countries where progress is less advanced, is the relationship between land sales and the land rental market. While restrictions on land sales still exist, a significant amount of land sales occurred in Hungary in the years preceding the survey. The survey includes evidence on household land purchases in the past years and current land rental activities. By incorporating both sets of information, we can derive important conclusions on the relationship between both.

The empirical part of the paper starts with a discussion of the data and general characteristics of land use and ownership in rural Hungary. Next, we present profiles of households who rent in land and of those who rent out land and we provide evidence how the behaviour of large farm enterprises affects small farmers' access to land through rental. Afterwards, we estimate econometrically the impact of household and farming characteristics,

such as physical and human capital, as well as land market and regional characteristics on land rental activities.

2 Theory

Consider a household with endowments of land $\overline{T}$, labour $\overline{L}$ and initial wealth $\overline{M}$. The household can derive income from agricultural production on its own farm and from off-farm wage employment. Agricultural output is produced according to the following increasing, strictly quasi-concave and twice continuously differentiable production function:

$$Q = f(T, L, X, \overline{Z}) \quad (1)$$

where T is the land used by the farm; L is the effective labour input on the farm; X is the amount of purchased inputs with price p_x; and $\overline{Z}$ is the amount of non-tradable inputs and fixed productive assets, like managerial or technical skills that are not rewarded by the labour market. We normalize the agricultural output price to one.

The land used, T, can be larger or smaller than land owned by the household, $\overline{T}$. If the household has more land than it wants to use it can rent it out or sell it. Additional land can be acquired through renting in or buying. Both the rental and sales markets are characterized by imperfections in transition countries. However, rental markets have developed much earlier and much more widely than land markets. Therefore, and to keep the analysis simpler, we will initially assume that land sales are not possible, and that the household can only rent land in or out. Later on we will discuss how the results are affected if buying and selling of land is possible.

Hence, we define the land used as $T = \overline{T} + T^i - T^o$ with $\overline{T}$ the land initially owned by the household, T^i the amount of land rented in and T^o the amount of land rented out. The rental price for land rented in (r^i) may differ from that of land rented out (r^o) due to

imperfections in the land rental market. Transaction costs, such as search costs and costs related to negotiating the terms of the tenure contract, result in the price for land rented in (r^i) to be higher than the price for land rented out (r^o) *ceteris paribus,* and $r^i - r^o > 0$ is an indicator of the size of the transaction costs.

Credit market imperfections are important in rural areas of transition countries. With credit market imperfections, a farmer may not borrow against future profits. In the development economics literature (e.g. Eswaran and Kotwall, 1986; Dasgupta, 1993) one typically assumes that access to loans depends on the amount of owned land. However, in transition economies, especially during the first decade of transition, financial institutions often refused land as collateral either because of imperfectly defined property rights, or because of thin land markets, or because of social pressure preventing them from taking over land in case of default (Swinnen and Gow, 1999). We therefore assume that access to loans B depends on the amount of owned land and productive assets and with B "small" and depending on the country and phase of transition. In addition, we assume that households have some own liquidity $\overline{M}$.

Labour market imperfections are due to off-farm employment constraints and moral hazard problems with hired labour. Moral hazard with hired labour requires supervision of workers. The effective labour supplied by hired workers therefore depends on the amount of family labour working on the farm, which is assumed to combine effective input and supervision, as well as on the area of land cultivated (Carter and Salgado, 2001; Feder, 1985). The effective labour input L is therefore:

$$L = L^f + s(T, L^f).L^i \qquad (2)$$

where L^i is the nominal amount of hired labour and L^f is the family labour devoted to the farm. The supervision function $s(T, L^f)$, with $0 \le s(.) \le 1$ reflects how nominal labour input is transformed into labour effort. The efficiency of supervision is a positive, but concave

function of family labour input ($\partial s/\partial L^f \geq 0$, $\partial^2 s/\partial L^{f\,2} \leq 0$), and diminishes as the farm size grows and, for a given level of family labour input: $\partial s/\partial T \leq 0$ and $\partial^2 s/\partial T^2 \geq 0$.

We assume the labour market is cleared by quantity rationing in order to fill the wage gap. Several theories explain why firms use quantity rationing instead of price rationing to clear the labour market (for example, the efficiency wage theory proposed by Akerlof and Yellen, 1986; the moral hazard model proposed by Shapiro and Stiglitz, 1984; the time rationing model by Yao, 2000). Here, the assumption of rationed off-farm employment opportunities is incorporated in the model by allowing that the wage paid to hired labourers (w^i) differs from the wage that household members can gain off farm (w^o) and by setting an upper limit ($\overline{L}^o$) to the amount of labour employed off farm (L^o).

Household utility is an increasing function of income (y) and leisure (l). Incorporating all the characteristics discussed above, the household maximisation problem is then:

$$\max_{\substack{L^f,L^i,L^o,l \\ T^i,T^o,X}} U(y,l) \tag{3}$$

$$\text{with} \quad y = f(L,T,X,\overline{Z}) - p_x X - r^i T^i - w^i L^i + r^o T^o + w^o L^o \tag{4}$$

$$\text{s.t.} \quad p_x X + w^i L^i + r^i T^i \leq B + \overline{M} + w^o L^o + r^o T^o \tag{5}$$

$$L^o \leq \overline{L}^o \tag{6}$$

$$\overline{L} = L^f + L^o + l \tag{7}$$

Inequality (5) reflects the liquidity constraint to which the household is subjected. Constraints on off-farm employment opportunities are incorporated in (6), while inequality (7) captures the time constraint of the household members.

The first order conditions for the amount of land rented in (T^i) and the amount of land rented out (T^o), and amount of family (L^f) and hired (L^i) labour devoted to the farm

$$T^i : f_T \leq (1+\frac{\delta}{U_y})r^i - f_L s_T . L^i \tag{8}$$

$$T^o : f_T \geq (1+\frac{\delta}{U_y})r^o - f_L s_T.L^i \quad (9)$$

$$L^f : f_L.(1+s_{L^f}.L^i) - w^o(1+\frac{\delta}{U_y}) + \frac{\mu}{U_y} \leq 0 \quad (10)$$

$$L^i : f_L.s(T,L^f) - w^i(1+\frac{\delta}{U_y}) \leq 0 \quad (11)$$

where subscripts refer to first derivatives and δ and μ are the lagrange multipliers for respectively the liquidity constraint and off-farm employment constraint. The first terms on the right hand side of equations (8) and (9) capture the opportunity cost of land in the presence of credit constraints. The second term (which is negative with $s_T < 0$) reflects extra supervision costs with growing farm size, if hired labour is working on the farm ($L^i>0$). With only family labour employed ($L^i = 0$), this term is zero. If there would be no transaction costs in the rental market ($r^i = r^o$), the demand for own land and rented land would be identical. With transaction costs in the rental market ($r^i < r^o$) the household will first use its own land[1]. Combining this with equations (8) and (9) implies that a household

rents in land if $f_T > (1+\frac{\delta}{U_y})r^i - f_L s_T.L^i$, (12)

does not rent land if $(1+\frac{\delta}{U_y})r^o - f_L s_T.L^i \leq f_T \leq (1+\frac{\delta}{U_y})r^i - f_L s_T.L^i$, (13)

rents out land if $f_T < (1+\frac{\delta}{U_y})r^o - f_L s_T.L^i$. (14)

We can use conditions (12)-(14) to derive several hypotheses on which factors affect the participation of rural households in land rental markets (all in *ceteris paribus* terms).

[1] This also implies that there is no simultaneous renting in and out. This result is based on the assumption that there are no other differences between owned land and land rented, for example, quality and location. If land plots have different characteristics, one may observe simultaneous renting in and out of land by the same household.

1. A household is more likely to rent in land (and less likely to rent out) if the marginal product of land (f_T) is higher. The marginal product of land is affected both by the intrinsic quality of the land and by the skills of the household in managing the land and farming it.
2. The land endowment of the household will affect the decision to rent. Given some fixed inputs, and market imperfections which constrain extending some other inputs, the marginal productivity of land will decrease with land use. If the marginal productivity of the land at the level of land owned by the household is still larger than the marginal costs of renting in additional land (i.e. inequality (12) holds) then the household will rent in additional land. This will depend on the amount of land owned by the household. The more land the household owns, ceteris paribus, the less it is likely to rent in and the more it is likely to rent out.
3. The household is more likely to rent in land if the land rental price is lower, and vice versa for renting out. Notice that, with given transaction costs, changes in the market rental price will affect both decisions to the same extent; or, in other words, will equally affect r^i and r°.
4. Transaction costs in the rental market will cause a gap between r^i and r°, and consequently will reduce both renting in and renting out. With $r^i - r^o$ larger the "autarky" interval in equation (11) increases. Such transaction costs can come from a variety of sources, such as search costs. In transition countries an important cause of the gap between r^i and r° may also be obstructions or imperfect competition in the land market by large farm organizations. The latter may complicate access to land for small farms and use their scale advantages in administration as well as in negotiating with small and dispersed land owners to increase the land rental price for small farms competing for land and decrease the rental price for households renting out.

5. Imperfections in the credit market also affect land rental markets. Credit market constraints are reflected in equations (12-14) in the value of δ, the shadow price of the liquidity constraint (5) in the household optimisation problem. More credit market constraints imply a higher value of δ and this will reduce the likelihood that a household will rent in land. It makes it more likely that it rents out land. There is a secondary effect that reinforces this. Credit market constraints will also reduce labour use on the farm. This can be seen from equations (10-11) where an increase in δ will result in less farm labour use. This will, in turn, cause a decline in the marginal productivity of land, f_T, and consequently, further reduce renting in of land and increase renting out of land.

6. Constraints on off-farm employment ($\bar{L}^o$) will also affect land rental decisions. Such constraints are reflected in equations (12-14) in the value of the μ, the shadow price of the constraint (6) in the household optimisation problem. If off-farm labour opportunities are scarcer (i.e. if μ is higher), more family labour will be used on the farm (equation (10)). This will increase labour input L and therefore raise the marginal product of land f_T. It follows from equations (12-14) that, through the increased marginal productivity of land, scarcer off-farm labour opportunities will induce a farming household to rent in more land (or rent out less land). The size of this effect depends on whether the household is using only household labour or whether it is hiring labour (in addition to its own household labour). The effect on land renting will be smaller when hired workers are employed on the farm because the supervision cost of monitoring hired labour weakens the effect. This can be seen from the first order conditions (10) and (11).

7. For the same reason, the household labour supply (L^f) will affect the land rental decisions. With supervision costs making hired labour more expensive than

household labour, the household labour supply will positively affect the decision to rent in land, and renting out of land.

8. Higher wages, either for off-farm employment (w°) or for hiring farm labour (w^{i}), or both, reduces renting in of land and increases renting out of land as employing labour on the farm becomes more expensive either in terms of actual wages or in terms of opportunity costs – which reduces the marginal productivity of land.

3 Land sales versus rental contracts

So far we have assumed that buying or selling land was not possible. This is the case in several transition countries, and in most transition countries for at least some period. For example, agricultural land sales were forbidden during the 1990s in Russia and most of the CIS countries. Hence, the hypotheses so far provide a sufficient theoretical framework for analysing rental markets in several transition countries. However, in other countries significant sales of agricultural land occurred in the past years. Moreover, land sales are likely to become a more important form of land exchange in the future. Therefore it is important to consider how land rental activities are likely to be affected when land sales are possible.

Let us consider the case when a household wants to acquire more land for farming. There are several reasons why a household may prefer buying land over renting in land, or vice versa. Factors that affect the trade-off between buying versus renting land include security of operation and investment returns, credit constraints, uncertainty regarding property rights, price and income risks, and psychological and cultural values associated with land ownership.

In doing so, it is important to distinguish between "early transition", characterized by major economic and institutional reforms and uncertainties, and insecure property rights, and

"the second phase of transition" when some of the basic reforms have been implemented, the economic situation has stabilized and property rights are more secure

Key characteristics of early transition, such as imperfectly defined property rights and major price and income uncertainty, are a major constraint on land sales. Unclear property rights were prominent in all transition countries in early transition and continue to be a major problem in several countries. They are obviously a major constraint on land sales. Economic and institutional uncertainties also constrain land sales. Both the demand and supply of land will be constrained when households are uncertain about the future incomes that land use will yield. This situation characterized early transition in many countries: prices for agricultural commodities and inputs changed dramatically and unexpectedly in the early 1990s. The result was few, if any, land sales and land exchange restricted to rental agreements.

In this paper we do not analyse the type of rental agreements (long versus short-term, tenant rights, etc.) However notice that ill-defined property rights and major uncertainties will also have an important impact on the rental market. Rental agreements may be restricted to short term and informal agreements. Such agreements do not provide the necessary security of operation and guarantee for investment returns to tenants, which they require for making optimal production and land allocation decisions. Moreover, in some cases rental agreements themselves may be constrained. For example, Macours (2001) shows how property rights insecurities affect the choice of partners in rental agreements in Latin America.

Consider now a "second phase of transition" situation. In other words, we assume that basic reforms have been implemented such that land rights are sufficiently well-defined for land sales to take place and that prices of inputs and outputs have become much more stable. Yet important transaction costs and imperfections remain in land, credit and labour markets – as captured by the theoretical model in the previous section. Let us consider again the case

when a household wants to acquire more land for farming. The key factors in the households decision are now the trade-off between security of operation and investment and credit constraints. Buying land (compared to renting) ensures the household that it can capture the benefits of its investment in the land; that it is certain to have sufficient land at his disposal for future cultivation; and guarantees the location and quality of its land. Further, it allows better production decisions as multi-year production cycles (e.g. perennial crops) can be included in its production plans. Other benefits are that land can be used as collateral for future investments and as an asset in the household's investment portfolio. Moreover, land ownership may play an important role as hedge against inflation for the household, and, in the absence of insurance markets, as a basis for employment and food security. Finally, it may bring social status and political influence (Deininger and Feder, 2002; Platteau, 2000).

The main advantage of renting land over buying is that it requires less liquidity or access to credit.[2] With credit market imperfections, this is a very important consideration in the household's choice. Credit constraints will reduce the demand for land by the household, as shown in the previous section, but will also make it more likely that additional land will be rented instead of bought by the household.

This trade-off between security of operation and liquidity for the farming household is not only important in transition countries. It also affects the decision between renting and buying of land in most western farms. For this reason, farms often combine owned and rented land. A minimum amount of owned land ensures security of operations while extending the farm by rented land prevents them from investing all their capital in land and to

[2] Renting land may also be preferred when increases in the household's land demand is temporary, for example due to temporary fluctuations in some of the other inputs.

use it for working capital or other investment purposes (Sadoulet et al., 2001; Swinnen, 2002).[3]

4 Data

The data used in the empirical analysis are household level data collected in a 1998 rural household survey in Hungary and county-level data from the Hungarian Statistical office. The survey is a representative country-wide survey of rural households 'with some farming activities'. The dataset includes data on more than 1400 households.

Household ownership of land and household farming has grown strongly since the beginning of transition (figure 1). Under the communist regime only 10% of agricultural land was used by households, mostly as garden plots. Around 66% of land was used by collective farms, the rest by state farms. One-third of the land used by collective farms was formally owned by individual members of the collective farms, but they had very little effective rights (Mathijs and Mészáros, 1997). These rights were restored during the land reform in the early 1990s.[4] In addition, the land reform process compensated former landowners, who had lost their land in the collectivisation process, through vouchers which could be used for purchasing land in the privatisation process. [5] About 2.5 million hectares of collective land and 0.2 million hectares of state owned land were privatised through voucher-based auctions. The remaining land from the collective farms was allocated to their members (European

[3] Here we ignore issues of security and regulation of rental contracts. In some countries in Western Europe, land tenure contract regulations provide very extensive security to the tenant. This shifts the preferences of farms to rental contracts as it increases the security benefits without increasing their credit requirements. For example, in Belgium extensive rental regulations resulted in 70% of land use under rental contracts; in the Netherlands landowners in the 1980s refused further rental contracts with farmers when regulations imposed too strongly on their property rights (Swinnen, 2002).

[4] There were major implementation problems since the land had been consolidated and been subject to land improvement activities under collective farm management.

[5] People eligible for compensation were farmers whose land was seized just after Second World War and farmers who were forced to sell their land to the collective farm for a low price in the 1970s and 1980s.

Commission, 1998).[6] Legal restrictions constrained land ownership and sales. Land received through compensation or as a share from the collective farms could not be sold for three years after receipt. There is an upper limit of land ownership of 300 hectares for individual ownership and legal persons and non-resident foreign citizens cannot own agricultural land in Hungary.

By 1998, households owned 84% of all agricultural land in Hungary, and used around 51% in household farms (or "individual" or "family" farms). The rest of the land is used by large scale cooperative farms and farming corporations, who each use around a quarter of Hungarian land.

Household farms are small on average and use mostly their own land: on average they cultivate 5 hectares and also own 5 hectares (see table 1). They provide only a small part of total household income: on average less than 20% of household income comes from farming (see table 2). Many of the farms are run by older (55 years on average) and low educated (9 years schooling on average) heads of households. Income from pensions makes up around 40% of total household income.

Three quarters (76%) of the households in the sample do not participate in the rental market. Sixteen percent of households rent out land, while around 8 percent of the households rent in land. Land is rented out to other households and to collective farms and farming companies. The average amount of land rented in is 15 hectares, and that of land rented out is 5 hectares.

There are important differences between households which rent in land and those who do not participate in the rental market or rent out land (see table 2). On average, the heads of households renting in land are significantly younger and slightly better educated. The

[6] The land cultivated by state farms was not subject to privatisation. The State Property Agency allocated the land as follows: 40 % was used for compensation of private persons, 37 % is used by companies which remain state property, 27 % was leased (mainly to former state farms) and 6 % was allocated to employees of state farms (Mathijs and Mészáros, 1997).

households cultivate much more land, and also own more land and machinery. More households in this group have access to machinery services and credit. Around 40% of their household income comes from their farming activities on average, compared to less than 16% in the other categories, and pensions accounts for around 20% of household income, significantly less than in other groups.

These average numbers already suggest important conclusions. In the next section we use an econometric model to formally test which characteristics are important determinants of household participation in the rental market, and to see to what extent external factors, such as regional variations in land quality and in competition in the land market affect land rental activities.

5 The Empirical Model

The empirical estimation includes two models. One model uses the amount of land rented out as dependent variable, the other model uses the amount of land rented in as dependent variable. Both empirical models have the following structure:

$$y_i = \alpha_0 + x_i\beta + l_i\gamma + r_i\delta + \varepsilon_i \qquad (15)$$

where y_i represent the dependent variable, x_i is a vector of variables measuring household characteristics, l_i a vector of county-level indicator variables of land market characteristics, r_i a matrix of regional dummy variables to capture fixed effects not captured by the other explanatory variables, and ε_i refers to the error term. β, γ and δ are vectors of parameters related to respectively the household characteristics, the county level indicators of land market characteristics and to regional variables.

The first set of variables are AGEHH and EDUCHH, measuring the age and the education level of the household head. Both are expected to affect the marginal productivity

of the land, and hence rental activities; although the impact may be non-linear (Rizov et al. 2001). Age may have a negative impact on renting in (and a positive impact on renting out) as younger household heads are expected to be more dynamic and entrepreneurial. On the other hand, experience will increase with age, which would lead to higher marginal productivity and hence more renting in of land. The trade-off between both effects may cause a non-linear effect with renting in first increasing with age and later declining.

Education, which is measured as years of schooling, is expected to have a positive impact on renting in because it increases the management capacity of the household. However, beyond a certain education level, household heads may get access to better off-farm opportunities, and hence reduce their labour allocation to farming and shift to off-farm employment. We test for non-linear effects of the age and education variables by including the squared terms of both variables.

Another factor which affects the marginal productivity of the land is the quality of the land. The information on the quality of the land plots used by the households provided by the household surveys had many missing observations. Therefore we use an indicator variable of the average land quality at the county level, QUALITY, which based on data from the Hungarian statistical office and which is measured in Gold Crown. Households working on better quality land are expected to rent in more land and rent out less.

We use three indicators for the land endowment of the household. LANDOWNED is the amount of land owned by the household when the survey was implemented in 1998. We expect this variable to be negatively related with the amount of land rented in, and positively with the amount of land rented out. Some of the households purchased part of this land during the previous years. To test whether there is a difference in whether the land was purchased in the past few years or whether the land was owned by the household before transition or given to them in the land reform process, we split up the land owned by the

household in its initial land endowment (LANDENDOW) and land purchased by the household over the 1990-1997 period (LANDBOUGHT). As explained in section 3, the household faces a security-liquidity trade-off in the decision whether to purchase or to rent in land. Therefore we expect a positive relationship between LANDBOUGHT and the amount of land rented in. To avoid multicollinearity problems, we first estimate a model including LANDOWNED and LANDBOUGHT and afterwards include LANDENDOW and LANDBOUGHT. The variables are included in squared form to capture non-linear effects.

The sales price of the land is also likely to affect the decision whether to buy or rent land. We do not have data at the household plot level on land prices. Therefore we include as a proxi the average land sales price at the county level, adjusted for quality, SALESPRICE.

To capture transaction costs in the land rental market, we include three variables. First, DOMFCO reflects the extent of domination of the land market by farming companies and cooperatives. Table 1 shows how in regions where only a very small share of the households (less than 5%) are renting in land farming corporations and cooperatives still cultivate on average 79% of the agricultural land. This is considerably larger than in regions where the percentage of households who are renting in land is larger than 10% (53%). Moreover, not only less households are renting in land, they rent in much smaller amounts of land (1 hectare versus 17 hectares). Further, not only are they renting less, they are using less fertile land. Comparing results from our survey with land quality indicators of the Hungarian statistical office indicates that in regions with domination of large cooperatives and companies, land used by households is of significant lower quality than the average land quality of the county (17% less on average), while in other regions we find no difference between the average quality of the land used by households and that of the county as a whole. All this suggests that households face important transaction costs in accessing land in regions dominated by large farming cooperatives and companies. To capture this, DOMFCO is a dummy variable

which equals one if more than 85% of the agricultural land in a county is cultivated by farming cooperatives and companies.

The two other transaction costs indicators are MEMCOOP and PARTCOMP which are dummy variables which equal one if a member of the household is a member of a cooperative farm or a partner in a farming company, respectively. These relationships are expected to reduce transaction costs either in renting land out to these large farms, or in accessing land for the household farm. They are expected to have a positive impact on access to land (renting in) and also on renting out land.

We included several proxi variables to capture household credit constraints and market imperfections. LOANACCESS is a dummy which is one if the household answered positively to the question "whether it had any outstanding loans", reflecting the households access to loans and credit. MACHACCESS is a dummy equalling one if the household had access to external machinery services. MACHINDEX is an index of machinery owned by the household.[7] With significant credit market imperfections our theoretical model predicts that all these variables would be positively related to renting in land, and negatively to renting out.

There is a potential endogeneity problem with the MACHINDEX variable since more land rental, and thus land use, may be correlated with using more machinery. To test whether this had any impact on the estimations we also ran a restricted model without MACHINDEX.

The share of household income coming from wage employment, WAGESHARE, may capture both credit and labour market imperfections. Access to off-farm income may reduce household credit constraints and as such lead to more renting in of land. On the other hand, a larger share of income from wage employment reflects less labour market constraints and, for reasons explained in section 2, would imply more renting out of land and less renting in. To check for any endogeneity problems, we also ran a restricted model without this variable.

The number of adult household members, ADULTS, measures the household labour supply and, in the presence of off-farm labour market constraints or moral hazard problems for on-farm labour use, will have a positive impact on renting in of land by the household.

Finally, three regional variables, EAST, WEST, and SOUTH, are included to capture additional fixed effects. The reference region is North-Central Hungary, which includes Budapest, the capital city.

6 Results

Two models were estimated using single censored Tobit regression. Each model was estimated on a different subsamples. The "rent-in" estimation used a subsample with zero or positive values for the amount of land rented in. The "rent-out" estimation used a subsample with zero or positive values for the amount of land rented out, and excluding landless households.

Estimating single tobit models on the two subsamples was preferred over pooling the data and estimating one least squares model, because the first procedure allows intercept and slope coefficients to be different for the two subsamples (see Skoufias (1995) for a more detailed argumentation). Conceptually, there is no obvious reason to estimate the decision-making process as a two-step procedure. Nevertheless, we also estimated a two-step Heckman model, but significant effects were only found for the allocation part of the model. The selection part of the model did not yield any significant results – consistent with our arguments, and with the use of a tobit model.[8] The results of the estimations of the models

[7] MACHINDEX is measured as a weighted index of household ownership of machinery and equipment items with the following weights: tractor=1, truck=1, cultivator=0.5, combine for cereals=2, feed combine=2, sowing machine=1, spraying equipment=1, milk processor=1, grape press=0.5

[8] These estimation results can be obtained from the authors.

are summarized in tables 3 and 4. Models I1 and O1 represent the basic models for renting in and renting out, respectively.

Renting in of land is affected by the age and education of the household head. Age has a non-linear impact on renting in of land. Renting increases with age up to the age of 45 years. The productivity gains from experience more than offset any reductions due to potential reductions in entrepreneurship or risk aversion over this age interval (see figure 2). After 45 years, the latter factors become more important than any further gains in experience and renting in of land falls with age, and strongly so after 55 years.

Education generally has a positive effect on age, especially when people have more than 8 years of education (see figure 3). Over the interval 3-20 years of education, which covers 98% of all observations, renting in declines slightly between 2 and 8 years of education. The significant effect occurs when household heads have more than 8 years of education. Then there is a strong positive effect on renting in.

We do not find non-linear effects of age and education on renting out of land. There is a strong positive effect of age on renting out: older people rent out their land instead of using it themselves. There is no effect of education on renting out.

We also find no significant effect of the average land quality in the county on household decisions to rent out or rent in land. This may imply that the data (county averages based on old indicators) do not sufficiently reflect household effects, or alternatively that other factors, such as land transaction costs and imperfections in labour and credit markets are much more important factors in determining household land rental decisions. The estimated coefficients on the landownership variables are all significant and indicate some interesting relationships between landownership and renting. The impact of the land variables is mostly non-linear, with significant coefficient estimates for several of the squared terms of the

variables. However, over the relevant domain of the analysis (99% of the observations fall within the 0-75 hectare rental area range) the first order effects dominate.

The coefficients of LANDOWNED in table 3 and 4 confirm our hypotheses that households who own more land are more likely to rent out land and less likely to rent in land, ceteris paribus. However, we find a highly significant and positive relationship between buying of land in the previous years (LANDBOUGHT) and renting in of land in the current period. This suggests that households who want to extend their cultivated area do so by a combination of buying and renting land. While they may prefer buying land for property rights security reasons, faced with important liquidity and credit constraints, they opt for renting of additional land. More land bought in the previous periods is likely to both increases the credit constraints in the current period because of the investments in the land purchase, and to reduce the marginal benefits of security, which falls with more land purchased already. Both forces explain the positive effect of the LANDBOUGHT coefficient. This conclusion is consistent with figure 4 which shows how both renting in and buying of land by households increase with the cultivated area for the household farm. Hence, with credit market constraints, both buying and renting in of land go together in the household's decision to increase its land use. The results of model I3 where LANDOWNED is replaced by LANDENDOW, the initial land endowment of the household, further confirm this conclusion: across all households, the amount of land initially owned by the household is negatively related with renting in of land, but purchases of additional land have a positive effect on renting in of land.

The coefficient of SALESPRICE is significantly positive. Land renting is more important in regions where the sales price of land, corrected for land quality, is higher. Where buying land is more expensive, ceteris paribus, households prefer renting land. Notice that this trade-off in the current period is not inconsistent with the complementary

relationship between buying and renting of land in an intertemporal perspective, as explained above.

The estimation results are consistent with our hypotheses on the importance of transaction costs in the land market. DOMFCO, MEMCOOP and PARTCOMP all have a highly significant effect on renting in of land by households. The domination of large farm organisations reduces access to land by households through the rental market. When households are partners of farming companies or members of cooperatives it is easier for them to rent land. Hence, these large farm organisations continue to have an important impact on the development of farming by household through their impact on the land market, in particular in regions where they continue to use most of the land.

The estimated coefficients of LOANACCESS, MACHACCESS and MACHINDEX all confirm that credit market constraints play an important role in the land rental decisions. All the variables have a very significant positive effect on renting in of land, and most are significantly negatively related to renting out of land. In model I4, where MACHINDEX is dropped for reasons of potential endogeneity, both LOANACCESS and MACHACCESS remain highly significant.

The share of household income coming from wage employment (WAGESHARE) has a highly significant negative effect on renting in of land. This result suggests that in rural Hungary labour market constraints may be more important than credit market constraints in the farm decision-making process on land allocation. When households get access to additional financial sources through off-farm employment, this, presumably positive, effect on renting in of land, is more than offset by the households' decision to allocate less labour on the farm and, as a consequence, to rent in less land.

The importance of labour market imperfections is also confirmed by the highly significant effect of the ADULTS variable, confirming that households with more adult members rent in significantly more land.

Finally, the coefficients of the regional variables show that renting in of land is considerably less in Eastern and Southern Hungary, and renting out is considerably higher in Western Hungary. Western Hungary borders Austria and considerably renting in this region is going on by Austrian farmers, sometimes in collaboration with local farms. At the same time, the closeness of this region to the Austrian border and of the North-Central region to the capital suggests that renting in of land is more active in regions in geographical proximity to places where high incomes are concentrated.

Conclusions

This study is the first formal analysis of the land rental market, and the relationship with household farms, in the transition economies of Central and Eastern Europe or the former Soviet Union. We derive several theoretical hypotheses on what determines the participation of household farms in land rental markets in transition countries. Households' management ability and land endowment, land quality and prices, transaction costs in the land market, credit market imperfections and constraints on off-farm employment were identified as important factors affecting land rental activities of rural households. Our empirical analysis, using data from a representative survey of small Hungarian household farms, provides empirical support for several of these hypotheses. More specifically, we draw the following conclusions.

First, we find that land rental markets allow households with higher farm management capacities to access more land. Better education of the household head is positively correlated with renting in of land. Ceteris paribus, middle aged farmers, who combine

experience with sufficient entrepreneurship, are renting in most land. When households grow older they rent in less and rent out more. As such rental markets play an important role in reallocating land between households with different needs and capacities in managing farms.

Second, a similar conclusion follows from the results on the impact of land endowment and ownership on land renting. Households use the rental market to rent in more land if their land endowment is small compared to their optimal farm size, and to rent out land in the other case. In combination, the first and second conclusion support the findings of Deininger and Songqin (2003) on land markets in rural Vietnam that rental markets allow "poor (in terms of land endowment) but able" producers to access land and extend their farm.

Third, households combine buying and renting of land to adjust their land holding to the optimal farm size. Buying of land provides them with a number of advantages over renting of land, such as security of operation and improved investment incentives. However, liquidity constraints in the presence of important credit market imperfections restricts buying as a strategy to enlarge the farm. Renting in of land is used to complement buying of land for enlarging the farm size. We find strong evidence that households who buy more land also rent more land. This conclusion is consistent with observations in Western Europe and the United States where many private farms also combine renting and buying of land to extend their farm size (Sadoulet et al., 2001; Swinnen, 2002).

Fourth, even in transition countries where the land reform is largely implemented and land titles distributed, important transaction costs may remain and can hinder efficient land transactions. In some regions of Hungary where large cooperative farms and farming companies use the vast majority of the land, the efficiency of the land market and positive equity effects are constrained by imperfect competition and unequal access to information and uneven enforcement of land rights and exchange. Moreover, in general, households with

connections to these large organizations, e.g. because household members are partners or members in them, have privileged access to land.

Fifth, we find that imperfections in the rural credit and rural labour markets play an important role in the functioning of the land market. Access to credit is strongly related to participation in the rental market: those households who can access loans or own machinery are renting in more land and renting out less. Credit constraints will also influence the land buying versus renting trade-off that households make.

Our analysis provides some evidence that constrained access to off-farm employment may have an even larger impact than credit imperfections on the land rental market. Access to off-farm income has a strong negative effect on renting in of land, suggesting that labour market constraints are inducing many households to hold on to land, or to rent in more land, compared to a situation when more alternative employment opportunities would be available.

In summary, these findings imply that land rental markets are playing an important role in reallocating land in transition economies to those most in need, i.e. households with relatively better farm management capacities and relatively less endowed with land. Land rental markets will continue to play an important role even when the importance of land sales transactions grow, and should not be seen as a temporary institution that will disappear. Therefore it is important to focus policy attention on a set of issues which need to be addressed in order to allow the rental markets to contribute to further efficiency improvements and poverty reduction in rural areas. These attention areas are, first, imperfect competition in the land market and transaction costs caused by large farm operators, and, second, constraints in other rural factor markets, in particular markets for credit and labour.

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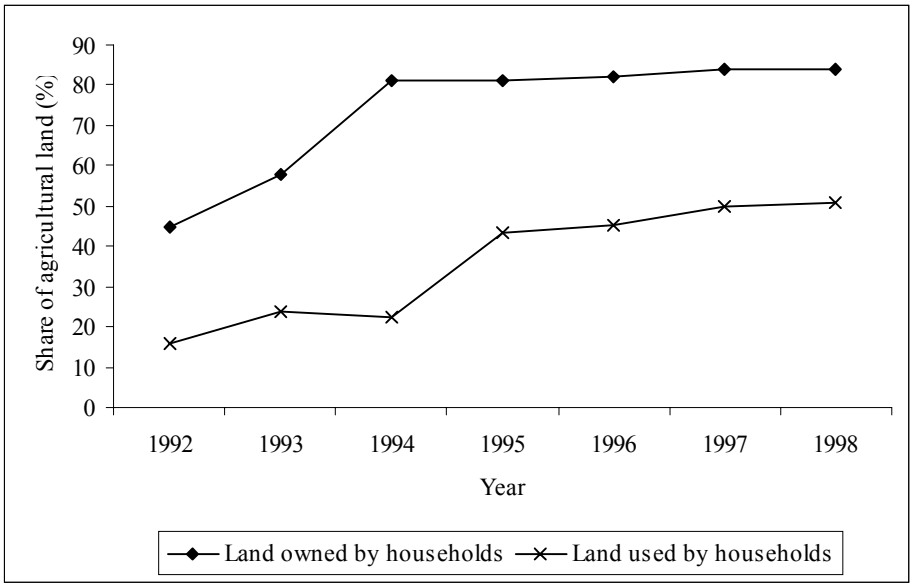
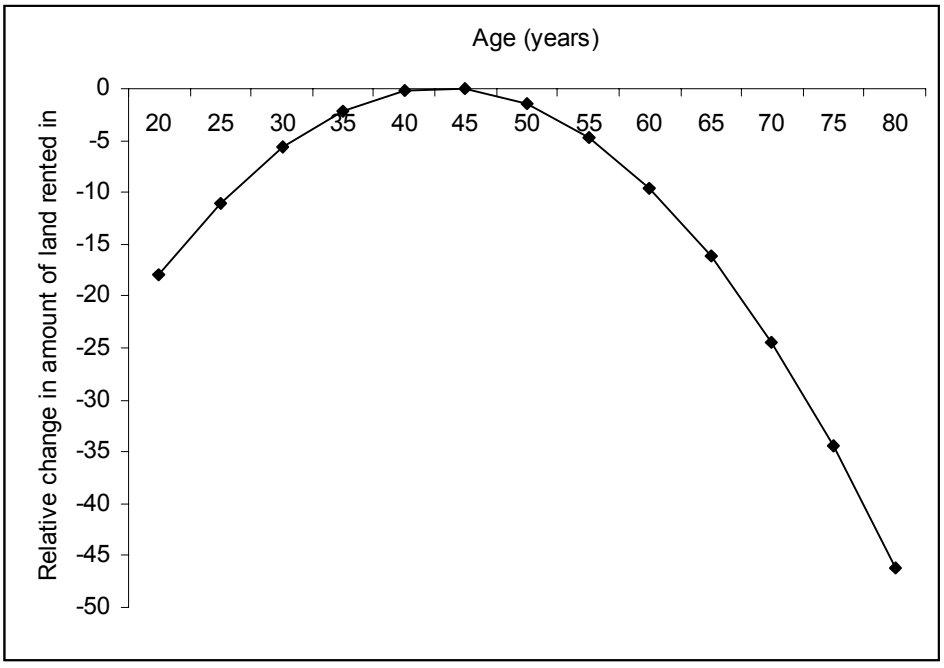
Figure 1: Growth of household farming during transition.



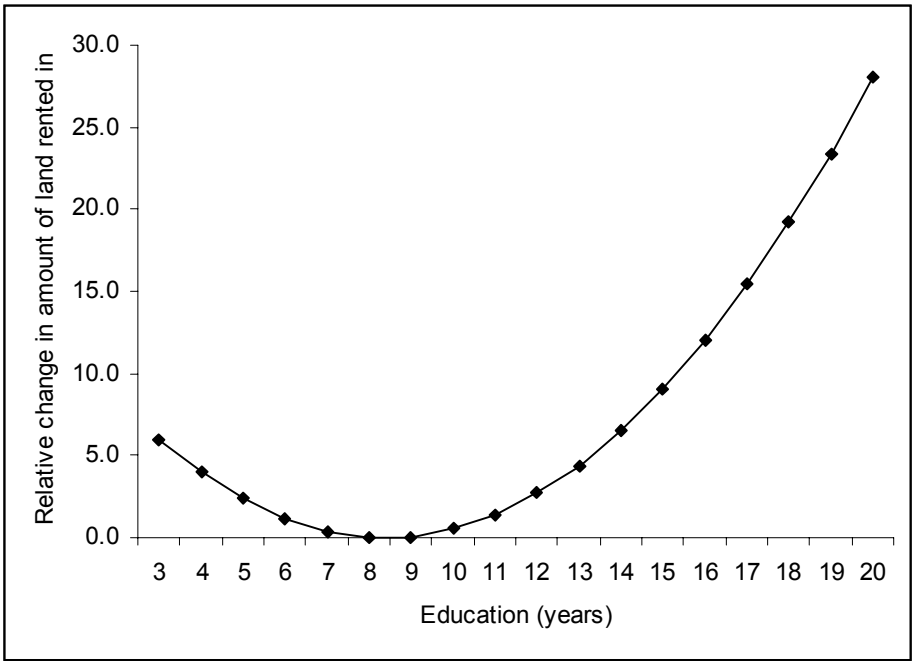
Source: Hungarians statistical office and European Commission

Figure 2: Change in land rented in by age of the household head



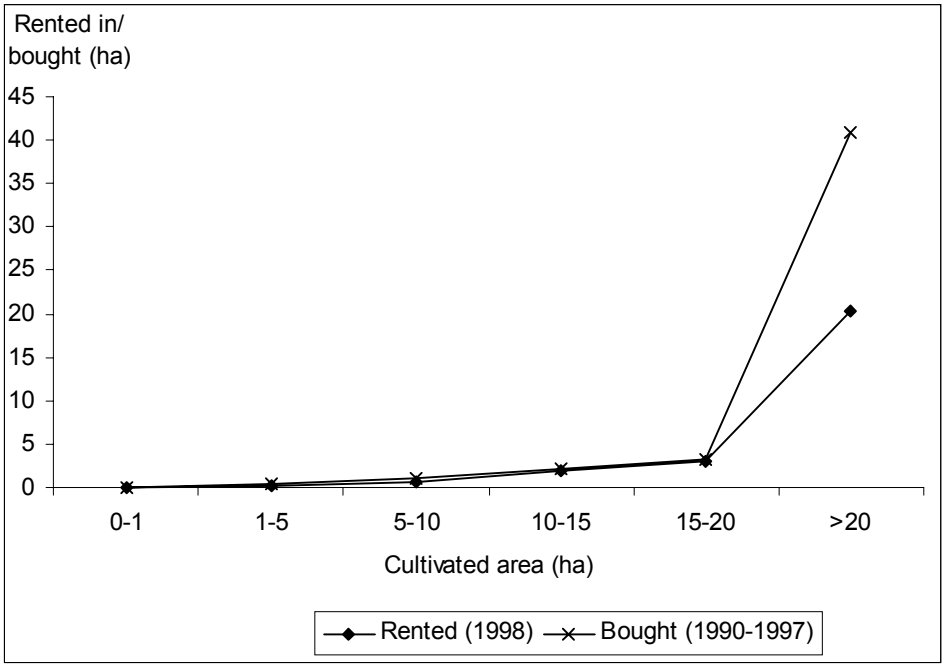
Source: Predicted values based on regression model I1.

Figure 3: Change in land rented in by years of education of the household head



Source: Predicted values based on regression model I1.

Figure 4: Amount of land rented in (1998) and bought (1990-1997) by size of household farms (1998)



Source: Own calculations based on survey.

Table 1: Regional differences in rental activities of Hungarian family farms

	Share of households renting in ≤ 5%	10% ≤ Share of households renting in	Total sample
Land cultivated (ha)	2	8	5
Owned land (ha)	4	7	5
Average amount of land rented in (ha)	1	17	13
Average amount of land rented out (ha)	6	5	5
Share of households renting in	2	13	7
Share of households renting out	8	16	16
Land quality reported by households (source: survey data)	15	20	20
Land quality at county level (source: national statistics)	18	20	20
Ratio quality reported by households county-level quality	83	100	99
Share of agricultural land cultivated by corporate farm	79	53	65
Share of households member/partner of coop/comp	9	23	19
Land price adjusted for quality	140	175	163

Source: Own calculations based on survey

Table 2: Household characteristics by rental activities

		Households that rent			ALL
		OUT	NOT	IN	
Number observations		238	1123	108	1469
Share of total sample	%	16.2	76.4	7.4	100
Cultivated land area	ha	2.9	4.2	*23.3	5.4
Own land area	ha	6.7	4.7	*9.7	5.4
Land endowment	ha	*5.6	2.8	*5.4	3.4
Land bought	ha	1.1	1.9	4.3	2.0
Member coop/partner comp	%	*47.9	12.6	*25.9	19.3
Age household head	Years	*58.6	54.6	*50.7	55.0
Education household head	Years	9.0	9.2	*10.4	9.3
Adult household members		2.7	2.6	*3.1	2.7
Loan access	%	2.5	3.2	*11.1	3.7
Machinery access	%	40.8	43.4	*69.4	44.9
Machinery index		*0.2	0.3	*1.3	0.4
Share owning machinery	%	*19.3	25.1	*58.3	26.6
Share income from wages	%	*31.9	36.7	33.2	35.7
Share income from farming	%	*11.7	15.9	*39.9	17.0
Share income from pensions	%	*49.7	41.6	*21.7	41.5

*Test for equal means household categories is rejected at a 0.1 significance level

Source: Own calculations based on survey

Table 3: Tobit regression with the amount of land rented in as dependent variable

	I1		I2		I3		I4		I5	
	Coef.	t-value	Coef.	t-value	Coef.	t-value	Coef.	t-value	Coef.	t-value
AGEHH	2.930	1.910 *	-0.493	-2.410 **	2.842	1.860 *	3.382	2.140 **	2.333	1.560
AGEHH2	-0.034	-2.290 **			-0.033	-2.240 **	-0.039	-2.560 ***	-0.026	-1.790 *
EDUCHH	-3.488	-1.250	1.300	1.860 *	-3.534	-1.270	-4.180	-1.450	-3.404	-1.200
EDUCHH2	0.208	1.710 *			0.212	1.750	0.261	2.090 **	0.191	1.540
QUALITY	-0.262	-0.460	-0.347	-0.610	-0.271	-0.480	-0.363	-0.620	-0.126	-0.220
LANDOWNED	-0.708	-1.650	-0.739	-1.680 *			0.265	0.550	-0.542	-1.260
LANDOWNED2	0.004	0.740	0.004	0.850			-0.005	-0.740	0.003	0.600
LANDENDOW					-0.924	-2.210 **				
LANDENDOW2					0.007	1.450				
LANDBOUGHT	2.477	3.820 ***	2.558	3.910 ***	1.794	3.190 ***	2.592	3.680 ***	2.403	3.670 ***
LANDBOUGHT2	-0.017	-1.940 *	-0.019	-2.080 ***	-0.013	-1.730 *	-0.017	-1.660 *	-0.017	-1.850 *
SALESPRICE	0.385	3.110 ***	0.405	3.250 ***	0.384	3.120 ***	0.447	3.440 ***	0.382	3.070 ***
DOMFCO	-20.617	-2.160 **	-21.379	-2.240 ***	-20.452	-2.160 **	-24.589	-2.460 **	-22.011	-2.290 **
MEMCOOP	7.809	1.430	8.375	1.540	7.827	1.440	10.219	1.780 *	6.788	1.240
PARTCOMP	27.945	2.920 ***	29.102	3.030 ***	27.863	2.920 ***	31.286	3.150 ***	27.283	2.870 ***
LOANACCESS	20.379	2.350 **	19.892	2.290 **	19.594	2.270 **	27.032	3.110 ***	19.956	2.290 **
MACHACCESS	17.771	4.000 ***	18.265	4.100 ***	17.878	4.070 ***	15.031	3.330 ***	17.864	4.000 ***
MACHINDEX	10.953	5.620 ***	11.467	5.820 ***	11.154	5.680 ***			11.838	6.030 ***
WAGESHARE	-0.230	-3.220 ***	-0.198	-2.810 ***	-0.231	-3.250 ***	-0.286	-3.860 ***		
ADULTS	5.068	2.710 ***	5.707	3.050 ***	5.068	2.720 ***	5.344	2.760 ***	3.808	2.080 **
EAST	-17.330	-3.010 ***	-17.046	-2.970 ***	-17.258	-3.020 ***	-20.840	-3.500 ***	-16.519	-2.870 ***
WEST	-4.002	-0.650	-4.445	-0.720	-4.043	-0.660	-4.905	-0.770	-5.963	-0.960
SOUTH	-27.924	-3.690 ***	-27.952	-3.670 ***	-27.965	-3.710 ***	-28.133	-3.610 ***	-26.823	-3.550 ***
CONSTANT	-163.237	-3.570 ***	-112.209	-4.520 ***	-159.949	-3.520 ***	-173.530	-3.650 ***	-163.297	-3.590 ***

Table 4: Tobit regression with the amount of land rented out as dependent variable

	O1		O2		O3		O4	
	Coef.	t-value	Coef.	t-value	Coef.	t-value	Coef.	t-value
AGEHH	-0.043	-0.210	0.118	3.220 ***	-0.058	-0.270	-0.049	-0.240
AGEHH2	0.001	0.750			0.002	0.900	0.001	0.710
EDUCHH	-0.398	-0.810	0.142	1.130	-0.364	-0.720	-0.393	-0.800
EDUCHH2	0.026	1.140			0.023	0.990	0.026	1.150
QUALITY	0.046	0.550	0.040	0.480	0.067	0.780	0.046	0.550
LANDOWNED	0.467	9.090 ***	0.469	9.060 ***	0.357	7.750 ***	0.462	9.110 ***
LANDOWNED2	-0.002	-5.750 ***	-0.002	-5.680 ***	-0.001	-5.360 ***	-0.001	-5.730 ***
SALESPRICE	0.020	1.170	0.018	1.050	0.012	0.690	0.019	1.160
DOMFCO	-1.484	-1.200	-1.347	-1.090	-0.800	-0.640	-1.435	-1.160
MEMCOOP	7.586	9.120 ***	7.578	9.110 ***	7.480	8.820 ***	7.605	9.140 ***
PARTCOMP	5.547	3.090 ***	5.561	3.100 ***	5.542	3.010 ***	5.596	3.120 ***
LOANACCESS	-0.522	-0.250	-0.474	-0.230	-0.294	-0.140	-0.552	-0.260
MACHACCESS	-1.686	-2.330 **	-1.665	-2.300 **	-1.711	-2.310 **	-1.700	-2.350 **
MACHINDEX	-3.677	-5.590 ***	-3.684	-5.590 ***			-3.700	-5.630 ***
WAGESHARE	0.009	0.700	0.008	0.650	0.014	1.040		
ADULTS	0.220	0.620	0.206	0.590	0.143	0.390	0.284	0.830
EAST	-0.101	-0.110	0.033	0.030	-0.079	-0.080	-0.132	-0.140
WEST	2.509	2.440 **	2.548	2.470 **	2.528	2.390 **	2.552	2.480 **
SOUTH	0.227	0.190	0.347	0.290	-0.510	-0.410	0.210	0.170
CONSTANT	-16.143	-2.450 **	-22.774	-5.420 ***	-16.441	-2.440 **	-15.403	-2.380 **

Source: Own calculations